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Miscellaneous.—Perlitic structure, according to Mr. Chapman,[22] may be produced in Canada balsam by heating this substance until it is thick enough to become brittle when cold, and then pouring it upon a roughened glass plate and suddenly immersing in cold water.——Harker[23] ascribes the eyes of pyrite in slate to the displacement of the matrix around pyrite crystals through pressure. Because of its hardness the pyrite resists the pressure. The slate yielding to it breaks away from the crystal along a plane perpendicular to the line of force, and leaves little hollows on both sides of it. The hollows are afterwards filled with quartz. The eyes consist of pyrite, forming a center, imbedded in a lenticular mass of quartz or some other secretionary mineral.——In a book of about two hundred and seventy pages Mr. Merrill[24] publishes a catalogue of the building stones in the collection of the National Museum, and gives a very clear and succinct account of the methods employed in quarrying and finishing the various rocks used in construction.——A very valuable account of the mineral resources of Michigan is given by Mr. Lawton[25] in his annual report as Commissioner of Mineral Statistics of Michigan.——Dick[26] describes a new form of binocular microscope for use in petrographical investigations, made according to his own design. The most important new feature of the instrument is the connection of the two nicols, which may be made to revolve together or separately, at the will of the manipulator.

BOTANY.

Three Suggestions on Botanical Terminology.—So far as I can find there are at least two very marked and interesting phenomena in the physiology of plants which have as yet received no appropriate names by which they may be always recognized and under which they may be discussed. These are—first, the peculiar irritability of twining plants, in view of which, together with their negative geotropism and their asymmetrical nutations, the spiral habit of growth is maintained. From the most recent researches it appears probable that Von Mohl was correct in his early conjecture that some such specific irritability existed in twining plants, and it is proper that this specific irritability should have its name, and that English writers on the subject should be freed from the necessity of expressing themselves upon it in paraphrases. Unless some better term has been devised or some little-used term should have priority, it is proposed to term the motion of twining plants—so far as that motion is the result of the specific irritability—*dromotropism*, and we can then speak of such twining shoots as dromotropic.

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[22] *Geol. Mag.*, Feb., 1890, p. 79.

[23] Ib., Sep., 1889, p. 397.

[24] Rep. Smiths. Institution, 1885–6, Pt. II.

[25] Mines and Mineral Statistics. Lansing, 1889.

[26] *Min. Mag.*, March, 1889, p. 160.

Again, certain very well-known but as yet very poorly understood movements take place during fertilization and conjugation, by means of which antherozoids are directed to the waiting oösphere,—perhaps passing down the long neck of an archegonium; by which pollen tubes reach the oösphere in the embryo-sac of phanerogamous plants, and in view of which it is possible for the conjugating, motile or resting, sexual cells of zygophytic plants to come in contact with each other through an intervening space of air or water or soil. In the case of the higher cryptogamous plants, where clear differentiation of male and female organs and cells exists, the directive impulse seems to originate in the oösphere itself. Possibly the movement of the antherozoids towards the oösphere—a movement of such great biological importance—should be explained by attributing, as has been done, to the oösphere the power of excreting some chemical compounds which, while of the nature of waste products or excreta, nevertheless exert a stimulative and directive effect upon antherozoids in the near vicinity. So far as I can learn careful experiments to indicate just how far the oösphere can exert this stimulative influence have not yet been made. It would be of the greatest importance to discover through how many millimetres of water, for example, a polypodium antherozoid would find its way to the proper archegonium, but in the present state of the knowledge upon this topic, we cannot speak very accurately. Should the conjecture of a chemical stimulus be the correct one, the whole series of phenomena connected with conjugation and fertilization, to which passing allusion has been made, would possibly be most analogous to the hydrotropic curvatures of roots and shoots in view of which growth takes place from a region less saturated with moisture to one more saturated, or *vice versa.* For evidently if any aromatic excretum is given off from a sexual cell it would be in greater quantity the nearer one came to the originating cell.

Movements, then, of antherozoids and pollen-tubes, since they are clearly irritable movements, might appropriately be termed *gonotropic*, and the movements of the water cells themselves towards the female might be termed *gonotropism.* If it were deemed necessary to distinguish between the movements of free, locomotive antherozoöids such as those of Marchautia or Aspidium and the curvature of pollen tubes, the name gonotropism could be appropriately reserved for the latter class of movements, while the former might have the name of *gonotaxis*, analogous to phobotaxis—seen in swimming green zoöspores and in chlorophyll bodies of unequal axes. The movements of antherozoöids then might be termed *gonotactic*.

In the case of phanerogams, however, the stimuli which direct the pollen tube do not seem to originate in the oösphere alone, but are apparently sent forth by the *synergidæ* or "co-workers" as well. That the pollen tube should pass between the synergidæ and thus penetrate to the oösphere lying directly behind them, whatever the position of the ovule itself, could scarcely take place unless some stimulus should be sent from the synergidæ. This peculiar habit of the pollen tube, most instructively shown in anatropous or campylotropous ovules, might be explained as due to a repellent influence or stimulus sent from the *synergidæ*, in view of which the pollen tube, growing in the line of least resistance, necessarily must pass between them,—as, for example, to use a rather violent simile, the sailors of ancient days steered between Scylla and Charybdis, avoiding each as far as possible. This irritability of the pollen tube, in view of which it avoids the synergidæ, can scarcely be explained by supposing that stimuli originate in the oösphere alone, for, if this were true, the uniform course of the pollen tube between the synergidæ would not become clear. Neither can it be explained by supposing the synergidæ and oösphere capable of equal gonotropic stimulation, for then the further growth of the pollen tube after reaching a point midway between the three cells at the top of the embryo-sac would become a matter of chance. Apparently then we must consider the synergidæ as cells capable of sending stimuli, probably chemical in nature, either similar to the gonotropic stimuli of the oösphere, but much feebler, or of a nature precisely the reverse of the oösphere stimuli. Concerning the point here suggested there is yet no experimental evidence sufficiently strong to allow more than conjecture. If, however, the conjecture of a specific gonotropic irritability, different in different species of plants, be accepted, the possibility of hybridization depends upon two preliminary coördinations; first, the tissues of the receiving stigma, style and ovary must be such that nutrition and growth of the stranger-pollen is possible; second, gonotropic stimulation of the stranger-pollen must intervene to direct the course of its growth. This makes no account of the act of fertilization itself, but refers merely to externals, if one might name them so. Evidently the highly specialized requirements of pollen-tubes in the matter of nutrition are properly supplemented by highly specialized specific gonotropic irritabilities. The first is exactly paralleled by the specific nutrition requirements of the various parasitic fungi, which select each their own particular host-plant or animal, but the second is *sui generis*.

When, however, the cells of zygophytic plants find their way to each other, as for example, the zoösphores of Pandosina, or the conjugating cells of Piplocephalus, there is scarcely a localisation of gonotropic irritability in one cell, and of gonotropic stimulation in the other. In such plants we are below the stage of specialization, and the whole act of conjugation is so unlike that of higher plants that a different name might properly enough be given to the peculiar directive influence which each conjugating cell has upon the other. They might truly be considered equally gonotropic and equally capable of stimulation; but for the sake of differentiating between the bisexual movements and the unisexual, it might be well to term the movement shown by either of two similar conjugating gametes gamotropism. That gonotropic irritability is a specialized type, an outgrowth from *gamotrophic*, goes without saying. Both are probably connected with the excretion of certain as yet unclassified chemical compounds, and the progression of the higher from the lower, with accompanying specializations, would open a field of research exceedingly interesting although exceedingly difficult.

Carefully conducted and systematic experiments are needed along two lines, suggested in this brief note upon so fertile a subject: 1st, Experiments to indicate the distance to which specific gonotropic stimuli can be propagated through the surrounding medium; 2d, Experiments to show, by cross-pollenations, the relation between gonotropic irritability and appropriate nutrition upon the growth and direction of pollen-tubes.—CONWAY MACMILLAN, *Univ. of Minn.*

The So-Called Uredospores of Gymnosporangium.—Mr. H. M. Richards has carefully re-investigated the so-called uredospores of *Gymnosporangium clavariæforme*, and finds that Kienitz-Gerloff's conclusions are erroneous. In a recent number of the *Botanical Gazette* Mr. Richards publishes the results of a series of germinations of both forms of spores, viz., the fusiform (teleutospores) and the clavate (the so-called uredospores), and shows that, however much they may differ in form, they certainly present no constant difference in their mode of germination. Under favorable conditions both give rise to the characteristic promycelium bearing sporidia. Under less favorable conditions variations may arise, *e. g.*, great elongation of the promycelium when grown in an excess of water, or its great shortening when the moisture was insufficient. In the latter case the short promycelial cells readily fall apart, and under favorable conditions grow into hyphæ. Spores of the latter kind Kienitz-Gerloff considered to be uredospores, but Mr. Richards shows conclusively that their peculiar germination is due to special conditions, and that they are therefore to be still regarded as teleutospores.

Hackel's Revision of the Andropogoneæ.—The sixth volume of the "Monographiæ Phanerogamarum" of the De Candolles is a notable work of over seven hundred pages, entirely devoted to a monograph of a single tribe of the great order of the Gramineæ. When one observes that in this book there are descriptions of 420 species, the vastness of the undertaking of the noted author is made evident. At the present rate it will require from five to seven thousand pages in all, or from six to eight or nine additional volumes like the present one.

Hackel divides the tribe Andropogoneæ into five sub-tribes, to which he assigns the thirty genera which he recognizes. The scheme of classification may be made out from the following synopsis:

ANDROPOGONEÆ. Kth. ampl.

Sub-tribe I. Dimerieæ Hack.

Genus 1. *Dimeria* R. Br. Japan, Malay Archipelago, Australia. 12 sp.

Sub-tribe II. Sacchareæ Benth. & Hook.

Genus 2. *Imperata* Cyril. Tropical and Sub-tropical. 5 sp.
“ 3. *Miscanthus* Anderss. Asia. 7 sp.
“ 4. *Saccharum* Linn. Tropical and Sub-tropical. 12 sp.
“ 5. *Erianthus* Michx. Tropical and Temperate. 18 sp.
“ 6. *Pollinia* Trin. Tropical Eastern Hemisphere. 29 sp.
“ 7. *Spodiopogon* Trin. Eastern Hemisphere. 5 sp.
“ 8. *Polytrias* Hack. Java. 1 sp.
“ 9. *Pogonatherum* Beauv. Eastern Hemisphere. 2 sp.

Sub-tribe III. Ischæmeæ Hack.

Genus 10. *Apluda* Linn. Tropical Eastern Hemisphere. 1 sp.
“ 11. *Ischæmum* Linn. Tropical Eastern Hemisphere. 42 sp.
“ 12. *Lophopogon* Hack. India and Australia. 2 sp.
“ 13. *Apocopis* Nees. Asia. 2 sp.
“ 14. *Eremochloa* Büse. Tropical Asia. 8 sp.
“ 15. *Thelepogon* Roth. India and Africa. 1 sp.

Sub-tribe IV. Rottbœllieæ Benth.

Genus 16. *Vossia* Wall. India and Africa.
" 17. *Urelytrum* Hack. Africa. 2 sp.
" 18. *Rhytachne* Desv. Tropical Africa. 4 sp.
" 19. *Rottbœllia* Linn fil. Both Hemispheres. 1 sp.
" 20. *Manisuris* Sw. Both Hemispheres. 1 sp.
" 21. *Opheurus* Gærtn. Eastern Hemisphere. 4 sp.
" 22. *Ratzeburgia* Kunth. Burmah. 1 sp.

Sub-tribe V. Euandropogoneæ Benth.

Genus 23. *Trachypogon* Nees. America, Africa, and Madagascar. 1 sp.
" 24. *Elionurus* Humb. Tropical and Sub-tropical. 15 sp.
" 25. *Arthraxon* Beauv. Eastern Hemisphere. 8 sp.
" 26. *Andropogon* Linn. Both Hemispheres. 193 sp.
" 27. *Cleistachne* Beuth. Tropical Africa. 1 sp.
" 28. *Themeda* Forsk. Eastern Hemisphere. 8 sp.
" 29. *Iseilema* Anderss. India and Australia. 5 sp.
" 30. *Germainia* Bal. & Poit. India and China. 1 sp.

Some of the species are wonderfully complex; for example, *Andropogon sorghum* Brot., which contains two sub-species, *halepensis* and *sativus*; the former with five varieties and seven sub-varieties; while the latter has thirty-seven varieties and twelve sub-varieties.

CHARLES E. BESSEY.

Sachs' History of Botany.[1]—The many readers of the NATURALIST who are familiar with the German edition of Sachs' History of Botany, which appeared in 1875, will be glad to see the work in an English dress. It will at once become much better known to botanical students, for with all our German teaching in the colleges, it is still a fact that books in the English language are read and consulted much more freely by students than when in German. The translation has been so well done in this case that American students may safely take it up in place of the original, expecially as the author has in this made some minor changes.

The work is divided into three "books," the first of which is devoted to the "History of Morphology and Classification," the second to the "History of Vegetable Anatomy," and the third to the "History of Vegetable Physiology." In treating these topics, the author says in his preface to the English edition : "I purposed to present to the reader a picture of the way in which the first beginnings of scientific study of the vegetable world in the sixteenth century made their appearance in alliance with the culture prevailing at the time, and how gradually, by the intellectual efforts of gifted men, who at first did not even bear the name of botanists, an ever-deepening insight was obtained into the relationship of all plants, one to another, into their outer form and inner organization, and into the vital phenomena or physiological processes dependent on these conditions."

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[1] History of Botany (1530-1860), by Julius von Sachs, Professor of Botany in the University of Würtzburg. Authorized translation by Henry E. F. Garnsey, M.A., Fellow, of Magdalen College, Oxford. Revised by Isaac Bayley Balfour, M.A., M.D., F.R.S., Professor of Botany in the University, and Keeper of the Royal Botanic Garden, Edinburg. Oxford: at the Clarendon Press. 1890. Crown 8vo, pp. xvi., 568.

In this preface several sentences attract the attention of the reader. For example: "I would desire that whoever reads what I have written on Charles Darwin in the present work should consider that it contains a large infusion of youthful enthusiasm, still remaining from the year 1859, when the 'Origin of Species' delivered us from the unlucky dogma of constancy. Darwin's later writings have not inspired me with like feeling. So has it been with regard to Nägeli."—CHARLES E. BESSEY.

Photographs of Dr. Parry.—I feel certain that I am obliging many botanists by stating that good photographs of the late Dr. C. C. Parry, the well-known botanist, may be obtained of Jarvis White & Co., of Davenport, Iowa, for twenty-five cents each. Wishing to place such a photograph in my gallery of botanists, I made inquiries, with the result given.—CHARLES E. BESSEY.

ZOOLOGY.

A New Actinian.—Dr. H. V. Wilson describes (Studies J. H. Univ., IV., No. 6) a new Actinian from the Bahamas, under the name *Hoplophoria coralligens*. It belongs in the family Antheadæ, and is noticeable from the fact that only six pairs of mesenteries reach the œsophagus, and in the position of four marginal sacs, which are highly developed stinging organs. In regard to Hertwig's suggestion that possibly the Madreporarian corals are a heterogeneous assortment of hexactinian polyps, which have independently acquired a skeleton. Dr. Wilson drops the hint that the study of the mesenterial filaments affords a negative argument. "Porous and aporous corals alike have simple filaments, but actinian have trifid filaments."